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## DEVELOPING SUPPLENESS TO PREVENT SCAPULOHUMERAL DISLOCATIONS IN PERFORMANCE ATHLETES

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### Abstract\*

**Aim.** In certain sports disciplines, the incidence of scapulohumeral dislocations is high. For this reason, introducing prophylactic programs in the preparation of athletes becomes a necessity. Anterior scapulohumeral dislocations are more frequently encountered than the posterior or lower-type ones, and very rarely the disorder becomes bilateral. Implementation of specific means in the preparation program of performance athletes leads to significant changes in the ligament apparatus and even in the ligament elasticity. Developing suppleness through special exercises has a decisive role in preventing dislocation.

This paper aims to bring theoretical arguments regarding the importance of suppleness in preventing scapulohumeral dislocation in performance athletes.

**Conclusions.** For performance athletes, it has been proven experimentally that performing movements with easiness and the lowest possible energy consumption occurs only when the level of suppleness is optimally developed. Avoiding the risk of injury, which leads to the emergence of dislocations, and even improving the development level of motor abilities and the technique of performance athletes requires a high degree of suppleness development.

**Keywords:** suppleness, scapulohumeral dislocations, performance athletes.

### Introduction

The concerns related to motor suppleness started from the thorough analysis of the way in which specialists in the field of physical education and sports used to interpret this concept. Thus, we have synthesized certain issues observed in practical activity, but which are less or not at all addressed in theoretical works. We thought that nominating and transposing them into theory could complement conceptual interpretations. (Macovei, 1999, p. 18)

Suppleness is considered by many specialists as the fifth motor quality. The study of suppleness presents the same interest as the other motor qualities, representing one of the important parameters in achieving performance. Generally, suppleness is defined as the ability of the body to perform motor actions with an increased range of motion.

As regards the chosen topic, we preferred the term "suppleness" to define the higher or lower level of performing the range of motion, with reference to joint mobility and the degree of elasticity of tendons, ligaments and muscles. These terms are associated by different authors in order to highlight specific details of the structures involved in achieving the

opening of joints. (Kettunen et al., 2011, p. 128)

The appropriateness of choosing the topic of this paper lies in the exigencies of performance sports, which require highly accurate technical executions. If the training of suppleness is properly done, injuries can be prevented.

It has been proven experimentally that, through the systematic practice of sport, ligament elasticity can develop significantly; however, it should be noted that particular differences have been recorded. The factor that largely restricts joint mobility is represented by muscle elasticity. Thus, in the case of performance athletes, suppleness occupies a prominent place and is extremely important in the activity carried out before and after training for improving this ability and preventing dislocations. (Berardi, 2005, p. 87)

### Current stage of knowledge

In literature, references to suppleness are associated with the terms: joint mobility, flexibility, muscle and ligament elasticity.

Analyzing the literature, we have found that some authors such as Nicu, Hâtru, Baroga and Bompa used the term "mobility", while others, for

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instance Ozolin, Zatiorschi and Manno, the term "suppleness". (Bompa, 2001, p. 21) These various ways of using terms that actually define the same ability tend to clarify fundamental details concerning the importance of this ability in performing movements. (Bompa, 2001, p. 22) Other authors, such as Mateev and Novicov (1980, p. 30), treated it as an ability of muscular and joint mechanisms.

Regarding suppleness, the question that can be raised is whether this ability is due to the effective combination of several factors, within which nervous mechanisms play a special role. It is about interpreting the concept from a broader perspective that refers to the quality of execution and the attitude of the athlete in motion. Adapting movement to the range-of-motion requirements for achieving various technical skills should also be related to the efficiency, ease and fluency of movements. (Macovei, 1999, pp. 18-19) Although it is considered to have limitations due to heritability, suppleness is influenced by the level and quality of specific training, providing the musculoskeletal system its autonomy of movement. (Petrofsky, Laymon, & Lee, 2013)

Permanently present when performing technical skills in different sports disciplines, suppleness is a less analyzed motor ability. Although significant, it is not included by some professionals among the four main motor abilities. This aspect is also seen from the perspective of terminology, which is not definitively clarified. (Reeser & Verhagen, 2006, p. 600)

Classifying motor abilities, Manno (1992, p. 29) has integrated suppleness into the group of intermediate motor abilities, namely between the conditional and coordination ones, emphasizing that its defective improvement represents a factor that limits maximum execution speed when learning the technique, because energy consumption is maximized, which leads to the onset of fatigue.

Developing suppleness involves a high number of repetitions.

There are recommended diverse exercises based on executions addressing both the joint range of motion and tissue elasticity. They can be performed either freely or with a partner, using different apparatus or objects. Exercises to develop suppleness will be achieved after a very careful preparation of the body (warm-up) and when the subject is rested, in order to prevent injury. (Reeser & Verhagen, 2006, p. 594) Suppleness can be developed with maximum efficiency, provided that the exercises have continuity and consistency.

Exercises to improve suppleness are arranged by series and number of repetitions. The same exercise can be performed in several series or it is possible to apply a set of exercises which exert successively the muscle groups, body segments and joint chains and which are repeated several times. (Famose & Durand, 1988, p. 76)

Low suppleness causes many disadvantages, such as:

- Extends the phase of learning and strengthening motor actions;
- Decreases the indices for improving other motor abilities (speed, coordination, power and endurance) and restricts their use with maximum efficiency;
- Reduces efficiency in performing motor actions, and the lack of suppleness is supplemented by additional effort and high energy consumption;
- Reduces the characteristic feature of execution, because movements cannot be performed in an expressive, free, relaxed and easy way. (Zatiorschi, 1968, p. 89)

Maximum range of motion in any joint, which is provided by its conformation, will be limited or advantaged by the ligament and muscle elasticity. Ligaments have the role of protecting joints against excessive demands, managing to restrict the movement of segments.

In motion, suppleness can be expressed in an active, dynamic passive or static way. When talking about active suppleness, we refer to the mobilization of body segments in motion through the effort of muscles. It can be either static (maintaining positions) or dynamic (a movement in progress). (Kettunen et al., 2011, p. 130)

Passive suppleness is achieved through the intervention of some external forces (partner, apparatus, the weight of one's body etc.). The values of passive suppleness are higher than those of active suppleness, the difference being given by the reserve suppleness, an aspect that can be developed by decreasing this gap in favor of the active form. (Macovei, 1999, p. 33)

Suppleness, similarly to the components of motor ability, may have internal biological determinations that will be influenced by external aspects coming from the environment and the activity performed by each person. (Macovei, 1999, p. 36)

Internal biological conditionings result from the morphofunctional characteristics of musculoskeletal system and the connections of these structures with other body systems. In their turn, external influences affect the expression of



suppleness through the quantitative or qualitative demands resulting from the specificity of practical activity. Scientific substantiation suggests that biological conditionings should be a priority, mainly the mechanical and regulatory coordination-related determinations. (Macovei, 1999, p. 36)

The need to develop suppleness results from the incidence of injury among athletes. One of the high-incidence injuries is scapulohumeral dislocation.

Dislocation is an extremely severe traumatic injury consisting in the displacement of joint extremities (articular areas will lose connections between them). In the case of scapulohumeral dislocation (SHD), after the action of a direct or indirect trauma, the humeral head will lose its normal connections with the glenoid cavity of scapula. SHD is one of the most common emergencies noted in practical traumatology.

Anterior scapulohumeral dislocations are more frequently encountered than the posterior or lower-type ones, and very rarely the disorder becomes bilateral. About 10% of traumatic dislocations that are not reduced in the first two weeks, for various reasons, will become old dislocations. Most often, scapulohumeral dislocation is present in adults and very rarely in children and elderly people. Shoulder dislocation is usually caused by severe trauma (injuries). (Hantiu, 2005, p. 88)

### **Perspectives in the field**

Suppleness will be developed with maximum efficacy if the exercises are performed every day (even twice a day). Training for improving suppleness should also continue after reaching the intended range of motion, because any interruption, even for a short time (7 days), leads to the loss of acquired skills. (Zamora, Kory-Mercea, & Zamora, 1996, p. 40)

Some causes that reduce suppleness are: wear and tear of the body, aging, height growth (in the case of children), tonic muscle resistance to stretching. Exercises for improving suppleness are executed in series, each series containing 10 to 15 repetitions. It is recommended to maximize the range of motion from one series to another. The indication refers to the fact that muscles would normally oppose stretching, their opposition decreasing progressively only after a higher number of repetitions. (Avrămescu & Ilinca, 2006, p. 109)

Concerning the development of suppleness, there can be two fundamental approaches. The former is muscle relaxation, which lowers excessive muscle tone and nervous consumption, sharpens muscle senses and provides effective blood irrigation.

The latter refers to the opening of joint angles. Through controlled stretching, it is aimed to maximize the degree of muscle elasticity. Executions are controlled and constantly repeated in certain positions that may prevent injury. (Dragnea & Bota, 1999, p. 71) As to the frequency and number of repetitions, it is considered that normally, during a training lesson, the number of repetitions can reach 90-100 for the spine mobility and 50-60 for the scapulohumeral joint. Certainly, the number of repetitions can increase up to a certain limit and subsequently they can be reduced, but not entirely. (Kettunen et al., 2011, p. 137)

As regards scapulohumeral dislocations, the practice has shown that physical therapy plays a particularly important role in treating and preventing them. To relocate a dislocated shoulder, there are used some methods and maneuvers that must be carried out by specialists, usually under local anesthesia of the affected area in order to relax the involved muscles. Among the most important maneuvers, we mention Kocher's method, which is used in the case of extra- or sub-coracoid dislocations and involves completing four successive phases, the Hippocratic therapy – the oldest known method (dating from ancient times). The patient lies in the supine position on a table, and the specialist holds his forearm with both hands, while placing the heel in his armpit. With both hands, a pulling force (traction) is exerted in the upper limb axis, counter-extension being achieved by the heel. After a short traction period used to obtain muscular relaxation, the arm is imparted an adduction movement, during which it is noted a click specific to the reduction of dislocation (the humeral head goes beyond the anterior end of the ankle). (Stănculescu, 2004, p. 92)

According to the treating physician's opinion, dislocation must be reduced quickly, whether this involves sometimes sedation or general anesthesia, using one of the aforementioned techniques. The shoulder needs to be immobilized for a period of 3 weeks, while the patient follows the recovery therapy. The main objectives of physical therapy for scapulohumeral dislocations are: improving the overall movement ability and the important functions, improving the function of the segment or segments directly involved in the disorder, preventing the emergence of defective compensatory skills, improving mental condition. (Sbenghe, 1981, p. 184) Also, suppleness has a vital role in preventing scapulohumeral dislocations and can be developed by means of special exercises that will be presented below.



### Utilitarian applications

Suppleness, like other motor abilities, has a special training methodology that includes many general aspects, which are subject to modifications, completions or adjustments, according to the specificity of each sports discipline or motor activity.

As utilitarian applications, we present a summary of the methodology recommended to develop suppleness.

The choice of means will take into account the needs of the athlete as regards technical preparation and overall physical preparation, as well as the athlete's anatomical and physiological potential.

To develop active suppleness, two important groups of exercises are recommended:

- Free exercises: bending, rotation, flexion-extension, swinging, all performed in series of 8-10 consecutive rhythmic repetitions. (Medlej, 2014)
- Exercises with weights (small-sized objects such as batons, dumbbells, medicine balls, elastic bands) that can use the effect of inertial motion and can increase muscle/ligament stretching.

To develop passive joint suppleness, there are recommended stretching exercises with one's body weight, with a partner or using various apparatus. (Berardi, 2005, p. 99)

- Combined exercises – 50% dynamic and 50% static ones for improving elasticity of certain muscle groups that may restrict movement and the strength of antagonists. To increase muscle suppleness, it is used a system of exercises that involve maintaining a certain position of a segment for a very short time, namely for seconds, in order to stretch a muscle gradually and prepare it for a specific effort that will be performed. The system is called "stretching" and has a positive influence on joint mobility. (Hantiu, 2005, p. 90)

Suppleness training operates with two kinds of objectives: one is focused on development, the other on maintenance.

Development objectives can be specific to preparation periods during which the work tasks aim to improve the forms of expressing suppleness. Maintenance objectives can be specific to competitive phases. Maintenance preparation is recommended to be performed by relating it directly to the technique and in an individualized way. (Macovei, 1999, pp. 99-100)

One of the working methods intended to develop suppleness is stretching. The athletes who want to use this method need to be instructed first, but most of all they need to be patient, because it has results that can be seen over time. (Macovei, 1999, p. 111)

Stretching is performed slowly and with no tension, and its purpose is to limber up the muscles and ligaments. Even if some people believe that stretching therapy is a modern treatment, it has its origin in the instinctive human behaviors such as extending one's arms, yawning, rubbing one's eyes etc. in the morning, upon awakening. All these actions, which are performed unconsciously, actually represent warm-up exercises for the muscle groups and the entire body. (Kettunen et al., 2011, p. 144)

The current training system based on stretching mostly involves movements that extend the muscles and joints. Compared to warm-up sports training, which uses a fast pace and relaxation, stretching training manages to extend the body parts slowly. (Bompa, 2001, p. 68)

Normally, stretching exercises are performed after any type of training, because all joints and muscles will be warmed up.

If such movements are executed separately, a warm-up routine can be useful. Stretching is performed at least 3 times a week for minimum 20 minutes. Any stretching exercise (position) is done 3 to 5 times in each session. (Medlej, 2014)

Stretching should be present both before and after the workouts of performance athletes. It can be practiced at any time of the day, from 10 minutes to 60 minutes. Exercises consist in muscle stretching, maintaining the position for 20 seconds and returning to the initial position. It is possible to execute only one series of exercises or any movement can be repeated three times. Muscle stretching should not be painful, and therefore this type of exercises must be initially performed in the presence of a specialist. (Zamora, Kory-Mercea, & Zamora, 1996, p. 45)

For most sports disciplines, the general training methodology recommends between 4 and 6 sessions per week to train suppleness. Also, for the preparatory periods focused on development objectives, suppleness training should be programmed every day. For the other periods with maintenance objectives and tasks, it is possible to schedule 3-4 training sessions per week. (Macovei, 1999, p. 88)

### Conclusions

In conclusion, suppleness is a motor quality that needs to be developed through various specific exercises, in the case of performance athletes, to prevent any type of injury, especially scapulohumeral dislocation. The most efficient method for training suppleness appropriately consists in applying all methods intended for athletes in the most advantageous combination, which can support the





achievement of objectives and work tasks. (Macovei, 1999, p. 113)

One of the methods designed to develop suppleness is stretching, as we have previously seen, which leads us to conclude about the importance of this type of exercise. Over time, stretching has become increasingly widespread due to its effectiveness in preventing injuries. Thus, performance athletes who practice sports in which the shoulder joint is often used will need an efficient exercise programme to develop suppleness, which should be performed in the presence of a specialist.

In the case of these athletes, because of the combined movements exerting the scapulohumeral joint, this type of dislocations has an increased incidence in our days, which indicates the need to develop suppleness.

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